

Serial No. 09/610,416

Filing Date July 5, 2000

P-4628-2-D1-1

COMBINED DECLARATION AND POWER OF ATTORNEY  
(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type:

<input type="checkbox"/>	original	<input type="checkbox"/>	divisional
<input type="checkbox"/>	design	<input type="checkbox"/>	continuation
<input type="checkbox"/>	supplemental	<input checked="" type="checkbox"/>	continuation-in-part (C-I-P)

INVENTORSHIP IDENTIFICATION

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor (If only one name is listed below) or an original, first and joint inventor (If plural names are listed below) of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION: MULTI-LAYER GOLF BALL WITH REACTION INJECTION  
MOLDED POLYURETHANE COMPONENTS

SPECIFICATION IDENTIFICATION

the specification of which:

- (a) ☐ is attached hereto.  
(b) ☒ was filed on July 5, 2000, as Serial No. 09/610,416.  
(c) ☐ was described and claimed in PCT International Application No. \_\_\_\_\_  
filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

☒ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and  
☐ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 CFR 1.98.

PRIORITY CLAIM (35 U.S.C. § 119(a)-(d))

I hereby claim foreign priority benefits under Title 35, United States Code, §§119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

- (d) ☒ no such applications have been filed.  
(e) ☐ such applications have been filed as follows

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN)  
PRIOR TO THIS APPLICATION AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)

COUNTRY (OR INDICATE IF PCT	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			YES NO

### CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S) (34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER

FILING DATE

\_\_\_\_\_/\_\_\_\_\_

\_\_\_\_\_

### CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S) UNDER 35 U.S.C. 120

I hereby claim the benefit, under Title 35, United States Code, § 120, of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information.

XX that is material to patentability as defined in 37, Code of Federal Regulations, § 1.56  
XX and that is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent, that occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application.

In compliance with this duty, there is attached an information disclosure statement, in accordance with 37 C.F.R. 1.98.

PRIOR U.S. APPLICATION OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 USC 120:				
U.S. APPLICATIONS		Status (check one)		
U.S. APPLICATIONS	U.S. FILING DATE	Patented	Pending	Abandoned
09/387,953	September 1, 1999		X	
09/040,887	March 18, 1998	X		
08/631,613	April 10, 1996	X		
08/591,046	January 25, 1996			X
08/542,793	October 13, 1995			X
08/070,510	June 1, 1993			X

ALL FOREIGN APPLICATION(S), IF ANY, FILED MORE THAN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

**POWER OF ATTORNEY**

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Diane F. Covello	Registration No. 34164	
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\_\_\_ hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.  
\_\_\_ Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

**SEND CORRESPONDENCE TO:****DIRECT TELEPHONE CALLS TO:**

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Spalding Sports Worldwide, Inc. Customer No. 24492

**DECLARATION**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**SIGNATURE(S)****Full name of sole or first inventor:****Viktor M. Keller****Residence:****2 Elm Meadows  
Chicopee, MA 01020, U.S.A.**Inventor's signature Date 12/06/00 Country of Citizenship: Germany Post Office Address: Same**Full name of second joint inventor:****Thomas J. Kennedy, III****Residence:****3 Mirick Lane  
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**Declaration & Power of Attorney (continued)**

**Full name of third joint inventor:** **William M. Risen, Jr.**  
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Date Dec 13, 2000 Country of Citizenship: U.S.A. Post Office Address: Same

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Date ~~November 24, 2000~~ 12/8/00 Country of Citizenship: U.S.A. Post Office Address: Same

**Full name of fifth joint inventor:** **Michael J. Sullivan**  
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Inventor's signature Michael J. Sullivan  
Date November 29, 2000 Country of Citizenship: U.S.A. Post Office Address: Same

Note: Changes and corrections  
made to pages 22, 23, 26, 29, 39  
which are attached in 3  
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X This declaration ends with this page.

acid) and the "Surlyn®" resins are zinc, sodium, magnesium, etc. salts of poly(ethylene-methacrylic acid), distinct differences in properties exist.

When utilized in the construction of the inner layer of a multi-layered golf ball, it has been found that the low acid ionomer blends extend the range of compression and spin rates beyond that previously obtainable. More preferably, it has been found that when two or more low acid ionomers, particularly blends of sodium and zinc ionomers, are processed to produce the covers of multi-layered golf balls, (i.e., the inner cover layer herein) the resulting golf balls will travel further and at an enhanced spin rate than previously known multi-layered golf balls. Such an improvement is particularly noticeable in enlarged or oversized golf balls.

As shown in the Examples, use of an inner layer formulated from blends of lower acid ionomers produces multi-layer golf balls having enhanced compression and spin rates. These are the properties desired by the more skilled golfer.

In a particularly preferred embodiment of the inner cover layer, a blend of high and low acid ionomer resins is used. These can be the ionomer resins described above, combined in a weight ratio which preferably is within the range of 10-90 to 90-10 high and low acid ionomer resins.

Another embodiment of the inner cover layer is primarily or fully non-ionomeric thermoplastic material. Suitable non-ionomeric materials include metallocene catalyzed polyolefins or polyamides, polyamide/ionomer blends, polycarbonates, polyphenylene ether/ionomer blends, etc., which has a Shore D hardness of  $\geq 60$  and preferably have a flex modulus of greater than about 30,000 psi, or other hardness and flex modulus values which are comparable to the properties of the ionomers described above. Other suitable materials include but are not limited to thermoplastic or thermosetting polyurethanes/polyureas, including castable polyurethanes/polyureas, reaction injection moldable polyurethanes/polyureas, thermoplastic block polyesters, such as a polyester elastomer marketed by DuPont under the trademark Hytrel®, thermoplastic block polyamides, such as a polyester amide marked by Elf Atochem S.A. under the trademark Pebax®, a blend of two or more non-

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ionomeric thermoplastic elastomers, or a blend of one or more ionomers and one or more non-ionomeric thermoplastic elastomers. These materials can be blended with the ionomers described above in order to reduce cost relative to the use of higher quantities of ionomer.

5 A preferred embodiment golf ball of the present invention comprises one or more inner cover layers disposed about a core. For example, mantle or inner cover layer 24 is depicted in Figure 5. The thickness of a mantle layer is generally governed by the thicknesses and weights of other components in a golf ball, namely the core and cover layer(s). The mantle layer  
10 generally comprises one or more of the materials or compositions described herein for the outer cover layer.

The preferred composition for the inner cover layer may comprise up to 100 weight percent of a non-ionomeric thermoplastic or thermoset material including a <sup>thermoplastic</sup> polyester polyurethane such as B.F. Goodrich Company's Estane® polyester polyurethane X-4517 or a reaction-injection molded material such as one or more of the Bayflex RIM polyurethanes from Bayer. The non-ionomeric thermoplastic material may be blended with a soft ionomer. For example, polyamides blend well with soft ionomer. According to B.F. Goodrich, Estane® X-4517 has the following properties as set forth in Table 6:

15  
20

TABLE 6

Properties of Estane® X-4517

	Tensile	1430
	100%	815
	200%	1024
25	300%	1193
	Elongation	641
	Youngs Modulus	1826
	Hardness A/D	88/39
	Bayshore Rebound	59
30	Solubility in Water	Insoluble
	Melt processing temperature	>350°F (>177°C)
	Specific Gravity (H <sub>2</sub> O=1)	1.1-1.3

NOT true, w<sup>h</sup>at knit lines may be reduced versus more conventional compression or injection molding processes. RIM still gives products having "knitted" areas and certainly still produces flow lines, turbulent mixing remnants and great along the parting line are generally the same as the properties of the mantle material at other locations on the mantle, including at the poles. The improvement in durability is believed to be a result of the fact that the reaction mixture is distributed uniformly into a closed mold. This uniform distribution of the injected materials eliminates knit-lines and other molding deficiencies which can be caused by temperature difference and/or reaction difference in the injected materials. The process of the invention results in generally uniform molecular structure, density and stress distribution as compared to conventional injection-molding processes.

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10 The most preferred commercially available polyurethane material for forming golf ball mantles in accordance with the present invention is Bayflex MP-10,000 system from Bayer Corporation of Pittsburgh, Pennsylvania. Although the Bayflex MP-10,000 two component polyurethane system is purported to be proprietary, the following information is available, set forth  
15 below in Tables 7 and 8.

Details of Bayflex Component A are as follows in Table 7:

*Note: This section is significantly broadened in scope and disclosure over previous applications in this family of patents, i.e. see U.S. 6,083,119, 5,803,831 and applications 08/542,793, 08/070,510*

moldable polyurethane and polyurea systems from Dow Chemical USA (Midland, Michigan), including SPECTRIM MM 373-A (isocyanate) and 373-B (polyol), and Elastolit SR systems from BASF (Parsippany, New Jersey). Preferred RIM systems include Bayflex® MP-10,000 and Bayflex® 110-50, filled and unfilled. Further preferred examples are polyols, polyamines and isocyanates formed by processes for recycling polyurethanes and polyureas.

### Outer Cover Layer

While the core with the hard inner cover layer formed thereon, provides the multi-layer golf ball with power and distance, the outer cover layer provides the multi-layer golf ball with power and distance, the outer cover layer 16 is comparatively softer than the inner cover layer. The softness provides for the feel and playability characteristics typically associated with balata or balata-blend balls. The outer cover layer or ply is comprised of a relatively soft, low modulus (about 1,000 psi to about 10,000 psi) and, in one embodiment, low acid (less than 16 weight percent acid) ionomer, an ionomer blend, a non-ionomeric thermoplastic or thermosetting material such as, but not limited to, a metallocene catalyzed polyolefin such as EXACT material available from EXXON, a thermoplastic or thermoset polyurethane/polyurea, including castable polyurethanes/polyureas, reaction injection moldable polyurethanes/polyureas, and injection moldable polyurethanes/polyureas, polycarbonates, thermoplastic block polyesters, such as a polyester elastomer marketed by DuPont under the trademark Hytrel®, thermoplastic block polyamides, such as a polyester amide marketed by Elf Atochem S.A. under the trademark Pebax®, a blend of two or more non-ionomeric thermoplastic or thermosetting materials, or a blend of one or more ionomers and one or more non-ionomeric thermoplastic materials.

The outer layer is preferably from about 0.010 to about 0.150 inches in thickness, more preferably 0.02-0.10 inches, more desirably 0.03 to 0.06 inches in thickness for a 1.680 inch ball and 0.03 to 0.07 inches in thickness for a 1.72 inch or more ball), but thick enough to achieve desired playability characteristics while minimizing expense. Thickness is defined as the average thickness of the non-dimpled areas of the outer cover layer. The



It has been determined that when hard/soft ionomer blends are used for the outer cover layer, good results are achieved when the relative combination is in a range of about 3-25 percent hard ionomer and about 75-97 percent soft ionomer.

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Moreover, in alternative embodiments, the inner and/or outer cover layer formulation may also comprise up to 100 wt % of a non-ionomeric thermoplastic or thermoset material including a polyester polyurethane such as B.F. Goodrich Company's <sup>thermoplastic</sup> Estane® polyester polyurethane X-4517 or a reaction-injection molded material such as one or more of the Bayflex RIM polyurethanes from Bayer. The non-ionomeric thermoplastic material may be blended with a soft ionomer. For example, polyamides blend well with soft ionomer. The properties for Estane® X-4517 were previously noted.

Other soft, relatively low modulus non-ionomeric thermoplastic or thermoset materials may also be utilized to produce the inner and/or outer cover layer as long as the non-ionomeric materials produce the playability and durability characteristics desired without adversely effecting the enhanced travel distance characteristic produced by the high acid ionomer resin composition. These include, but are not limited to thermoplastic polyurethanes such as Texin thermoplastic polyurethanes from Mobay Chemical Co. and the Pellethane thermoplastic polyurethanes from Dow Chemical Co.; non-ionomeric thermoset polyurethanes including but not limited to those disclosed in U.S. Patent 5,334,673; cross-linked metallocene catalyzed polyolefins; ionomer/rubber blends such as those in Spalding U.S. Patents 4,986,545; 5,098,105 and 5,187,013; and, styrene-butadiene-styrene block copolymers, including functionalized styrene-butadiene-styrene block copolymers, styrene-ethylene-butadiene-styrene (SEBS) block copolymers such as KRATON materials from Shell Chemical Co., including functionalized SEBS block copolymers; and, Hytrel polyester elastomers from DuPont and Pebax polyesteramides from Elf Atochem S.A.

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Notwithstanding the foregoing, it is most preferred to utilize a reaction injection molded (RIM) polyurethane cover as described herein.